

REMARKS

STATUS OF THE CLAIMS

Claims 1, 3, 5, 10-15, 17-27, 29-40, 42-46, and 48-57 are currently pending.

Claim 9 was canceled, while claims 1, 10, 11, 17, 18, 20, 32, 38, 39, 45, 49, 50, and 51 were amended when the RCE was filed. No claims have been cancelled or amended as part of this response.

No new matter has been added.

1. Rejection of Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 based on 35 U.S.C. § 102(b)

Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 stand rejected as allegedly being anticipated by Gessell (US 4,496,660) and Garoff (WO 01/55230). Applicants respectfully disagree. They reiterate their prior arguments, and note the following.

Gesell (US 4,496,660)

Gesell is directed to the preparation of a catalyst, whereas the present invention is directed to the preparation of a catalyst support. Therefore, two different approaches were used.

In this respect the Office states that "applicant argues that the reference uses an additional step (adding TiCl_4) that is not necessary, however applicants use comprising language, so this in no way detracts from the ability of the reference to disclose the instant invention". However, such a step will never be carried out in the process of the present invention as only a catalyst support is prepared (and not a catalyst), which naturally will not comprise any transition metal compound.

The catalyst support and the method for its preparation claimed in the present application differ from the disclosure of Gesell. The differences may be seen by comparing the properties of the catalyst, which may be prepared from the catalyst support of the present invention, and the catalyst disclosed in Gesell.

The comparable feature in both the present invention and Gesell is the oxidation state of, for example, the Ti in the catalyst. In every embodiment of Gesell, a reducing agent has to be reacted with the Ti catalyst in the last step in order to reduce the Ti^{4+} (from TiCl_4) to Ti^{3+} or Ti^{2+} . This is due to two reasons: (a) the addition order (Al compound to Mg compound), and (b) the fact that in Gesell the resulting solid product is extensively washed to remove all hydrocarbon soluble reaction products. In the present invention, the addition of a reducing

agent is not necessary, because about 50% of the Ti has been reduced in the catalyst just by contacting TiCl_4 and the support material (cf. Table 3 of the present invention). Due to the different oxidation state, a higher activity catalyst is prepared from the catalyst support of the present invention. Thus, the person of skill in the art will recognize that the currently claimed catalyst support must have different and superior properties when compared to the prior art and in particular, Gesell.

The Office also states that "Applicants argue that this [the addition of TiCl_4] is done to insert a reducing agent, and the instant application can add TiCl_4 without a reducing agent. However, as stated above the claim uses comprising language, and furthermore, examiner ask where is the reducing agent?". However, in Gesell TiCl_4 is added to prepare the catalyst. Then, $\text{Al}(\text{Et})_2\text{Cl}$ is added as a reducing agent (cf. column 12, line 45-51) to reduce the Ti^{4+} . In the present invention, the catalyst support is the reducing agent, as explained above.

With respect to (a) cited above, the Office states that "Applicants argue that the instant invention a solid reaction product is obtained by reaction of magnesium compound with aluminum compound and in example 22 of Gessell these compounds are in the same solvent (hexane). This is not persuasive

because: 1.) When Gessell is read carefully it can be seen that Gessell does not say what solvents the Mg and Al are in only that so many ml of solutions of each are used..." Applicant draws the Office's attention to column 16, lines 20-34 of Gesell. In this paragraph it is explicitly stated that the dibutylmagnesium is provided in a solution in heptane-hexane and that the triisobutylaluminum is provided in a hexane solution. Thus, the same solvent systems are used in the present invention and in Gesell.

The Office also asserts "...Gessell also does not say that the reaction product has not started to precipitate out of solution." Applicant wishes to draw the Office's attention to column 25, lines 29-31 of Gesell. In this paragraph, which is part of Example 22, it is stated that after the mixing of the Al and the Mg compound a "resultant stirred solution" (emphasis added) is obtained. By definition, a solution does not contain any precipitate.

The Office further asserts "... 2.) Gessell also makes solid reaction products..." and "Applicants argue that Gessell need an extra halide source to precipitate. This is not persuasive because Gessell does not teach that the halide source is needed

for precipitation". In rebuttal, Applicants note the following. In Example 22 of Gessell, it is only after the additional addition of silicon tetrachloride (a halide source; cf. column 11, lines 63-68) that precipitation starts. In contrast, in the currently claimed invention, precipitation starts after the addition of the Mg compound to the Al compound. Clearly, the reactions are different.

Summarizing the above, Example 22 of Gessell teaches that dibutylmagnesium is reacted with triisobutylaluminum, n-propylalcohol and silicon tetrachloride. As a result, a hydrocarbon insoluble product is obtained (but not until after the addition of silicon tetrachloride) which is further reacted with TiCl_4 and $(\text{Et})_2\text{AlCl}$.

The Office also states that "Applicants argue that the instant application always uses an aluminum halide, where the reference use an alkyl aluminum and show the formula $(\text{Al}(\text{R}_1)_y\text{Cl}_{3-y}; y < 3)$. This is not persuasive because a reference is not limited to the preferred embodiments and clearly Gessell teaches at column 1, lines 30-35 the use of aluminum halides, furthermore, the halide source would serve to form aluminum halide in situ, which, would still read the Claims as they use comprising language." Applicant respectfully disagrees.

First of all, in column 1, lines 30-35, which is part of the Background of the Invention, Ziegler catalysts are described in general. The specific aluminum compounds encompassed by the claims are not mentioned. If it is the Office's position that the Ziegler patents mentioned in the Background of the Invention section of Gessell make all later developed Ziegler-Natta catalysts obvious, then Applicants respectfully request that this be clearly stated for the record.

Second, in the present invention, a Mg compound according to formula (I) is reacted with dimethyl aluminium chloride, diethyl aluminium chloride, methyl aluminium dichloride or ethyl aluminium dichloride to form the solid catalyst support. This reaction is not disclosed in Gesell. Instead, Gessell, in step (I)(A)(1) teaches the reaction of $MgR_2 \times MeR'_x$ (where Me is Al, Zn, or B; and neither R_2 nor R' may be substituted with an alkyl group) with "an oxygen-containing and/or nitrogen-containing compound..." (cf. column 2, lines 55-68 of Gesell). There are no halogens present in this compound (which is the same compound as prepared in the first step of the process of example 22). See Col. 6, lines 30-65, where the magnesium compound is described and specific examples of non-halogen containing magnesium compounds are given. This further clarifies the differences between the currently pending claims and Gessell.

Gessell then further reacts this magnesium compound with a reducing agent or a halide source, which is not encompassed by the currently pending claims. This difference also distinguishes the currently pending claims from Gessell.

Contrary to the assertion by the Office that "Gesell clearly teaches ratios of Mg/Al that would read on the instant application, albeit they are not described in the same manner, but one skilled in the art would be able to understand that they overlap," Applicant submits that The $MgR_2 \times MeR'_x$ formula is the only Mg/Al "ratio" given in Gesell; no explicit ratio is described.

Finally, the Office states that "Applicants allege that the instant invention has superior morphology, but two similar or identical compositions made in similar or identical ways would be expected to have similar or identical properties absent the showing of any evidence to the contrary". However, as explained above, the compositions are not similar. In the present invention a catalyst support is obtained having an average particle size distribution between 1 to 500 μm . Gesell is totally silent with respect to this feature as Gesell is directed to the preparation of a catalyst, wherein the properties of a support are not important. This can be seen as a further indication that the specific steps of the present

invention (addition order, washing step) lead to particles having properties not disclosed in the prior art.

Garoff (WO 01/55230)

Garoff is concerned with the preparation of a catalyst by impregnating liquid catalyst components into a porous support material. Garoff is totally silent with respect to the preparation of a solid catalyst support. This differs from the present invention, which is directed towards the preparation of a solid catalyst support. Simply because of that, Garoff and the subject matter of the currently pending claims are different

Garoff and the currently pending claims also form different products due to order in which the reagents are reacted. The Office states that *"Applicants argue that in Garoff no precipitation occurs. This is not persuasive because in the preceding paragraph the applicants state that the reference teaches that precipitation can be prevented by adding toluene, so it is not understood how applicants argue in one paragraph that something happens in a reference then in the very next paragraph argue that it does not, applicants appear to be possibly confusing the references"*. The Office appears to misinterpret applicant's argument. The Office's attention is

drawn to page 13, lines 1-9 of the present invention, where the solvents used in the present invention are listed. Thus, the skilled man will recognize that the same solvents or solvent mixtures (e.g. toluene-pentane solvent mixture) are used in the present invention and in Garoff (cf. Example 2 of Garoff). No other way of interpretation is possible. In this solvent system, the addition of an Al compound to a Mg compound leads to a Mg complex, which is soluble in the solvent mixture (cf. page 16, lines 30-31 of Garoff). A precipitate does not form. However, in contrast, in the present invention, the different addition order, i.e. adding the Mg compound to the Al compound, leads to a precipitate, which forms the solid catalyst support. Thus, changing the addition order of the components in the same solvent systems surprisingly leads to products having completely different physical properties: Garoff affords a liquid while the claims encompass a method that affords a solid.

Garoff does not prepare or discuss the preparation of a solid catalyst support. Rather, Garoff uses solid supports, such as silica. See example 4. Thus, the porous particulate support used in Garoff has nothing in common with the catalyst support prepared in the present invention.

As a consequence of the above, Garoff is also completely silent with respect to the narrow average particle size distribution between 1 to 500 μm , which is obtained using the method of the claims.

Finally, the Office states that "*Applicants argue that Garoff is silent as to washing to adjust the Mg/Al ratio. This is not persuasive because Garoff washes a similar or identical composition with the exact same solvent, so if it adjust the ratio of Mg to Al in the instant invention, then it would be expected to do the same in the reference, absent any evidence to the contrary*". Applicant respectfully disagrees. Garoff is totally silent with respect to any washing step at all. In the description and the Examples no washing step is carried out. This is due to the fact that in Garoff, a solution of the Mg/Al reaction product is formed. Consequently, Garoff can not describe that the Mg/Al ratio may be adjusted during a washing step.

In light of the above, there are substantial differences between the subject matter of the currently pending claims and Gessell and Garoff. Thus, the claims are novel over the Garoff and Gessell references. As a result, reconsideration and withdrawal of the anticipation rejections is requested.

3. Rejection of 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57
Based on 35 U.S.C. § 103(a) in view of WO 99/55741
(Vereecke et al.)

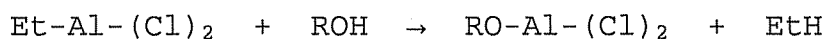
Claims 1, 3, 5, 9-15, 17-27, 29-40, 42-46, and 48-57 stand rejected for allegedly being obvious in view of WO 99/55741 (Vereecke et al.). Applicants respectfully disagree.

Vereecke (WO 99/55741)

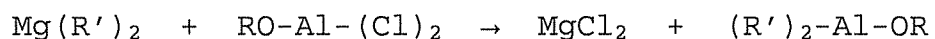
The Office states that "Applicants argue that since Vereecke washes his composition any reducing activity is washed away. This begs the question, if the reducing power is washed away in the reference how does it remain in the instant invention?" First, it should be emphasized that the catalyst support of the present invention is desired to have reducing power. This is achieved by the specific preparation method - where the defined starting compounds are contacted with each other in the specific addition order as claimed and the resulting solid support material is washed in a controlled way to adjust the Mg/Al ratio to a desired level. Reducing power here should be understood to mean the reducing power towards the Ti^{4+} that is in the added TiCl_4 . Further, it should be noted that in claim 1 of Vereecke's patent, it is said that the

produced support material is washed in order to remove all unwanted reducing power from the support material, which will prevent TiCl_3 precipitation during the titanation step; otherwise a catalyst with poor morphology would result (cf. page 5, last paragraph to page 6, lines 1 and 2).

In order to ensure that the catalyst support of Vereecke will not have any residual reducing power, Vereecke uses a two step process. The first step is characterized by adding alcohol to the R-Al-(Cl)_2 chlorination agent to eliminate its reducing power according to the following equation (where R is Et):

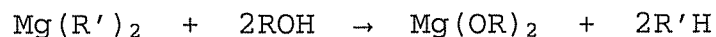


When this chlorination agent is reacted with Mg(R')_2 the longer R' group from the Mg compound is transported over to Al making it more soluble according to the following equation:

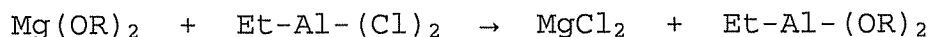


In Vereecke's second step, the reducing power of the now formed $(\text{R'})_2\text{-Al-OR}$ compound is washed away - this is more easily done as the Al compound now has a much longer alkyl group attached to it. As explicitly stated in claim 1 in Vereecke's patent, the support material is washed in order to remove all unwanted reduction power of the support material.

In contrast to Vereecke, in the currently pending application the Mg(R')_2 is first reacted with the alcohol according to the following equation:



When the Mg(OR)_2 compound is reacted with the Et-Al-(Cl)_2 (an Al-chlorination agent), the resulting Al-alcoholate is much less soluble due to the presence of a shorter alkyl chain, i.e. the original short alkyl chain in the Al-chlorination agent which is not substituted during this reaction step. The reaction is:



Due to the lower solubility of the formed Et-Al-(OR)_2 , when compound compared to the $(\text{R'})_2\text{-Al-OR}$ of Vereecke, the reducing power of the formed support material of the present invention can be adjusted by washing with a solvent. The resulting reducing power in the Borealis support is demonstrated in Table 3 (p. 26).

Thus, the properties of the catalyst support obtained using the method encompassed by the currently pending claims differs from that of Vereecke.

Further, the Office states that "Applicants argue that that the reference uses a different Mg compound offers the formula $(Mg(OR_1)_{(2-n)-x}(R_1)_nX_x; 0 < n < 2; n \text{ is never } 2, \text{ i.e. } 2-n-x \text{ can never be zero. Applicants claims clearly show that there is an additional limitation in their equation that was left out stating } x < 2. \text{ Simple arithmetic shows that both } n \text{ and } x \text{ can be at least } 1. \text{ As it is well settled in the field of mathematics that } 1 + 1 = 2, \text{ and furthermore, that } 2 - 2 = 0, \text{ and even further that } 2 - 1 - 1 = 0. \text{ It follows that, } 2-n-x, \text{ can indeed be } 0".$ Although the Office is correct in its analysis that " $1 + 1 = 2$, that $2 - 2 = 0$, and that $2 - 1 - 1 = 0$ ", it has missed the proviso that "the sum of $(n-2)$, n and x is 2". Consequently, the subscript $(2-n)-x$ can never be 0 and thus, the starting Mg compounds of Vereecke and the present invention are different.

In addition to that, the Al compound that the Applicants use to react with the Mg compound differs from that in Vereecke. In the present invention dimethyl aluminium chloride, diethyl aluminium chloride, methyl aluminium dichloride or ethyl aluminium dichloride is used, whereas in Vereecke an $RO-Al-(Cl)_2$ compound is used. Nothing in the prior art suggests the use of any other Al compound (e.g. in Garoff no precipitation occurs with a different Al compound).

Finally, the Office states that "Applicants argue that Vereecke teaches against the "reverse" order or the order claimed, and states that poor morphology is obtained. However, this is not a true teaching away situation as Vereecke does not teach that it will not work only that it is not preferred, but even if Vereecke teaches that it is not preferred, Vereecke teaches it as submitted by applicants own admission." Applicant is confused about this argument. In Vereecke it is explicitly stated that the addition of the Al compound to the Mg compound is not suitable for the production of a catalyst with a narrow particle size distribution (cf. page 11, lines 3-4). Thus, the person of skill in the art would not draw the conclusion that Vereecke suggests the opposite. If the prior art states that a particular process does not work, there is no motivation for the person of skill in the art to use the non-working process and there is no expectation of success. That is why it was so surprising that a narrow particle size distribution (between 1 to 500 μm) was obtained using the claimed method - Vereecke said it would not work and Vereecke teaches away from it.

Thus, taking the above differences between the present invention and Vereecke into account, the person of skill in the art would not arrive at the teaching of the present invention

neither from Vereecke alone nor from any combination of the prior art. Therefore, the currently pending claims are not obvious and withdrawal of the rejection based on 35 U.S.C. §103(a) is requested.

CONCLUSION

Applicants respectfully contend that all requirements of patentability have been met. Allowance of the claims and passage of the case to issue are therefore respectfully solicited.

Should the Examiner believe a discussion of this matter would be helpful, he is invited to telephone the undersigned at (312) 913-2114.

Respectfully submitted,

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